

Patent application

For: A SYSTEM AND METHOD FOR AUTHORIZING,
DISTRIBUTING AND REPLAYING DERIVATIVE HYPERMEDIA
CONTENT

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To whom it may concern: the following is a full specification of an
application for letters patent.

A SYSTEM AND METHOD FOR AUTHORIZING, DISTRIBUTING AND REPLAYING DERIVATIVE HYPERMEDIA CONTENT

The present invention relates to the field of information processing on a network
such as the World Wide Web (WWW) and, more specifically, to authoring,
5 distributing, and replaying derivative hypermedia content.

As the World Wide Web (WWW) becomes a more significant information source,
there is an increasing need to share and reuse WWW information.

It is herein recognized as being desirable that a WWW user should be enabled to
place annotations on WWW documents. There are prior art systems which allow
10 certain kinds of annotations to be placed on WWW documents. The well-known
Mosaic browser allows annotation of static text to a WWW document. However,
this system has the limitation that the annotation was stored along with the
document, and thus required the permission of the document owner to create an
annotation. This prevented annotation on arbitrary pages as permission was
15 typically not forthcoming, and it also resulted in security risks for the document
owners who did grant permission. It also prevented users from having private
annotations on a document.

Other systems, such as the ViewDirector Prism system, from TMS Sequoia, and
the HotOffTheWeb system from Insight Development, allow graphical annotation
20 on WWW documents. However, these annotations are static in nature, meaning
that there is no timing or navigation information stored with them. Such a system
cannot easily be used to author a tour through several pages as is herein recognized
to be desirable. Moreover, these systems do not support voice annotation.

A natural mechanism for explanation or exposition is the so-called dynamic
25 annotation, such as is described for image data in U.S. Patent No. 5,838,313, issued
17-Nov-1998 in the names of Hou, Tai-Yuan et al. (Siemens Docket #95P7547),
whereof the disclosure is hereby incorporated by reference to the extent it is not
inconsistent with the present application. Briefly, that application discloses a
multimedia-based reporting system which utilizes a command interpreter to receive
30 inputs from a user and forwards the inputs to an open report handler, a save report

handler, a delete current report handler, a mail report handler, a static annotation handler, a dynamic annotation handler including a recording and playback handler, an annotation on annotation handler, an attach media handler and a print report handler. Most relevantly to the current invention, the dynamic annotation handler
5 allows the individual to record/playback annotations from the user input.

Creating an annotation involves recording the mouse gestures, drawings, and voice of the annotation author, along with timing information, so that the annotation can be later replayed in just the way that the author created it. Unlike the Mosaic, Prism, and Sequoia systems mentioned above, users of a dynamic annotation
10 system could see the graphical annotations unfold in time with the comments of the author.

In accordance with an aspect of the present invention, there is described a tool which allows a WWW user to author a new kind of WWW content which is derivative from existing WWW documents. A user is able to add annotations to
15 WWW documents, and record a "guided tour" through a series of WWW documents. The resulting tour is a combination of the existing WWW documents, the ordering and timing introduced by the author, and the author's annotations.

In accordance with another aspect of the invention, the idea of dynamic annotation is extended to also record navigation events. In this way, hypermedia documents
20 can be toured in an annotation.

In accordance with an aspect of the present invention, there is described a multimedia based system for authoring, distributing, and replaying derivative hypermedia content, including a tool which, for example, allows a WWW user to author a new kind of WWW content which is derivative from existing WWW
25 documents.

In accordance with another aspect of the invention, there are primarily three components to the system: an authoring system for recording dynamic annotations on hypermedia, a distribution system for distribution of those annotations, and a playing system for playing those annotations. The authoring and playing systems
30 are comprised in a hypermedia browser, while the distribution system is partly

comprised in the browser and partly in a special remote server. The part of the distribution system within the browser is called the annotation manager, and the remote server is called the annotation server.

5 The present invention, as hereinafter described by way of exemplary embodiments, integrates the idea of dynamic annotation with a hypermedia browser such as a WWW browser. A traditional hypermedia browser is augmented with systems for recording, distributing, and playing dynamic annotations of hypermedia documents. The invention generates new opportunities for creating and sharing derivative content from hypermedia sources such as the WWW.

10 The invention will be more fully understood from the following detailed description of the preferred embodiments, in conjunction with the drawing, in which

Figure 1 shows the overall architecture of the system, as implemented for use with the WWW;

15 Figure 2 shows a layout of an embodiment in accordance with the present invention; Figure 3 shows the flow of control of a hypermedia browser in accordance with the present invention;

Figure 4 shows the operation of the system in accordance with the present invention in annotation mode;

20 Figure 5, in reference to a system in accordance with the invention, shows the operation of the annotation distribution system for the storing of an annotation.

Figure 6, in reference to a system in accordance with the invention, shows the operation of the annotation distribution system for the alerting users of the presence of annotations.

25 Figure 7 shows the operation of the system in accordance with the present invention, during annotation playback.

As the most widely used form of hypermedia is the WWW, the invention will be illustratively described herein in terms of the WWW, although the concepts and general design are fully applicable to any hypermedia system.

Figure 1 shows the overall architecture of the system, as implemented for use with the WWW.

5 A traditional WWW browser has several components, notably a network interface which can access documents from remote sites on the network using well-known protocols such as HTTP, and a document renderer which converts structured documents into a form which is understandable by a user. These components are widely available for incorporation into extended systems, as for example from the FastNet ActiveX component set from NetMasters LLC. To allow the users to access the new features of the current invention, several new user-interface objects
10 are added. Each of these objects is described with the relevant new component.

Figure 2 shows a layout of a typical instance of this invention, with the new user interface objects indicated.

15 The invention described in the afore-mentioned U.S. Patent No. 5,838,313 allows the user to author dynamic annotations on electronic documents. The present invention allows the user to author annotations within a program for browsing hypermedia and furthermore exhibits three novel features: the capture and recording of navigation events, the capability to include multiple documents within an annotation, and the capability to insert hyperlinks to existing annotations.

20 On pages 8 and 9 of the afore-mentioned U.S. Patent No. 5,838,313, a list is provided of "significant events" which are to be recorded in the annotation. Briefly, it is therein stated, in the context of events recorded during recording that two types of discrete events are included, the user-activated events and the time-sliced events. The user-activated events, of concern herein, have the format (event_name, time, parameters). Events were described therein for many typical
25 user-activated events such as moving a user-interface object on the screen, changing the color of some text, erasing a graphic, etc.

In accordance with the described embodiment of the present invention, the list of significant events is extended to include the following navigation events, which are common in hypermedia browsers:

30 - following a hyperlink

- invoking "forward", "back", "refresh", or "home" browser commands
- jumping to a document through the use of a history list
- jumping to a document by invoking a "bookmark"
- scrolling the document in the viewable area

5 As with other events described in the afore-mentioned U.S. Patent No. 5,838,313, in accordance with the described embodiment of the present invention, each event is stored as (event_name, time, parameters). The first four navigation events are all stored with the event_name NEW_DOCUMENT, and with a single parameter that stores the target document ID. Normally, this ID uniquely identifies the document.

10 In the case of WWW documents, the Universal Resource Locator (URL) serves as the ID. The scrolling events are stored as with the event name SCROLL and have one parameter to indicate the scrolling direction (left, right, up or down), and a second parameter to indicate the magnitude of the scroll.

15 Figure 4 shows the operation of the system in accordance with the present invention in annotation mode. During the authoring of an annotation, the occurrence of a navigation event other than a SCROLL event causes the hypermedia browser to load and render a new document in the usual way. The recording of the annotation, including the audio recording and the clock, pauses while the new document is loading, and resumes when the loading is completed.

20 This allows multiple documents to be annotated within the same annotation. As the clock is paused during loading, times for all events are stored independent of the loading time of the various documents accessed. For example, if the user causes a MOUSE_MOVE event, the timestamp for this event would be the number of milliseconds since the annotation began, minus any time spent downloading.

25 Another novel feature of the dynamic annotation authoring component is the capability to create hyperlinks to existing annotations. The user creates a hyperlink by clicking on the target annotation identifier (marked H in Figure 2) in the annotation manager box (marked G in Figure 2) both of which are described in the next section. The hyperlink is stored as an event with event_name

ANNOTATION_LINK, a time, and one parameter giving the identifier of the target annotation.

In order to allow the user to access the features of the dynamic annotation authoring system from within the hypermedia browser, two user-interface objects were added to the traditional browser interface. These are:

- a browser-mode box with three buttons: browse, annotate and watch (A,B, and C in Figure 2)
- an annotation-mode box with two buttons: scribble and text (D and E in Figure 2)

A mode box is a collection of options, only one of which can be valid at a time. Figure 3 shows the flow of control of the hypermedia browser as determined by the two new mode boxes. The browser-mode is normally *Browse*, in which case the annotation-mode box is disabled (shown). In *Browse* mode, the normal WWW operations are in effect. Clicking on the annotate button switches the browser-mode to *Annotate*. In this mode (see Figure 4), events (including the navigation events listed in the previous section) are captured and stored as in the aforementioned U.S. Patent No. 5,838,313, depending on the annotation-mode. The annotation-mode box is enabled. Clicking on the text button sets the annotation mode to *Text*, and clicking on the scribble button sets the annotation-mode to *Scribble*. In both annotation-modes, mouse events are captured. In the *Scribble* mode, MOUSE_MOVE events following a MOUSE_DOWN event, but preceding the next MOUSE_UP event cause a line to be drawn.

In *Text* mode, no lines are drawn, and MOUSE_DOWN events are used to fix the X,Y coordinates for TYPE events. The first TYPE event receives the X,Y coordinates of the last MOUSE_DOWN event, and successive TYPE events receive the same Y coordinate and an incremented X coordinate appropriate for the font size.

As shown in Figure 3, clicking on the browse button returns the browser to *Browse* mode, and ends the annotation. Clicking on the watch button switches the browser

to *Watch* mode in which the current annotation is replayed, as described in section
“A Means for Playing Dynamic Annotations of Hypermedia.”

A second principal component of the invention is a system for distributing
annotations. This system includes elements within the hypermedia browser, called
the annotation manager, and elements at a remote server, called the annotation
server. In general, the system allows the user to store annotations at the annotation
server. When another user accesses the same hypermedia document, the browser
checks the server for any annotations on that document. If there are, these
annotations are made available to the new user for viewing.

In order to allow the user to access the features of the dynamic annotation
distribution system from within the hypermedia browser two user-interface objects
were added to the traditional browser interface:

- a save button (labeled F in Figure 2)
- an annotation manager box (labeled G in Figure 2), which contains annotation
identifiers (labeled H in Figure 2).

After having authored an annotation and having returned to *Browse* mode, the user
has the option of storing it on the annotation server. User interface element F is the
save button. As shown in Figure 5, pressing the save button invokes a dialog box
of the traditional kind, which allows the user to enter a name for the annotation and
their own name. Once a name is entered, the annotation is written to the local disk
as an annotation file, as described in the afore-mentioned U.S. Patent No.
5,838,313. The file is then transferred to the annotation server through the use of
FTP or a comparable file transfer protocol, along with its name and/or the name of
the author. An optional feature is that the annotation manager generates a visual
icon representing the annotation, and sends that to the annotation server as well.

At the annotation server, the annotation file is stored in the annotation store. The
annotation store can be any kind of traditional database. The annotation file entry
is indexed by the unique ID of each document included within the annotation.
These IDs can be extracted directly from the NEW_DOCUMENT events in the
annotation file.

As shown in Figure 6, each time a user accesses a document using the hypermedia browser, the annotation manager queries the annotation server using the ID of the document. If any annotations are stored in the annotation store which have been indexed with that ID, the names of these annotations, their authors, and their icons
5 if available, are returned to the annotation manager. These names and icons are then displayed to the user in the annotation manager box, which is user interface element G, each separately, as shown in user interface element H. The user is thus made aware of any annotations which may be available for this document.

There are many protocols for restricting a user's rights to viewing annotations, each
10 of which may be useful in different situations. Such protocols and will not be particularly described herein, in that the present invention is compatible with a number of possible choices of access protocol.

While the invention disclosed in the afore-mentioned U.S. Patent No. 5,838,313 allows the user to play dynamic annotations on electronic documents; the present
15 invention enables the playing of annotations within a program for browsing hypermedia, and extends operation with three new features: the capability to play annotations over multiple documents, an enhanced synchronization system to handle arbitrary document loading times, and a means for displaying temporal hyperlinks to other annotations.

The user of the system can play previously recorded annotations by clicking on any
20 of the annotations listed in the annotation manager box described previously. In addition, an annotation author can view the annotation he has just made by switching the browser into *Watch* mode, as shown in Figure 3. The operation of the system during playback is shown in Figure 7.

As described in the afore-mentioned U.S. Patent No. 5,838,313, annotations are
25 played by processing each event that has been stored, in turn, while maintaining the timing as much as possible. In the case of NEW_DOCUMENT events, the ID of the document is passed to the traditional browser modules for loading and rendering. Any subsequent events, such as drawing of lines or mouse gestures, are

displayed on the new document. In this way, annotations over multiple documents can be played.

A difficulty posed by multiple-document annotation, as opposed to single document annotation, is that the time required to load and render a new document is not consistent from recording to playback, or even from one playback to another. This is particularly true with WWW documents, for which the loading time can vary substantially. At playback time, this can cause the recorded audio and events, which are on an absolute timeline, to become unsynchronized with the associated document. In the present invention, this problem is solved by pausing both the recording and playback of annotations during the loading and rendering of new documents. Specifically, when a NEW_DOCUMENT event is processed in *Watch* mode, playback is paused until the browser notifies the playback module that loading and rendering are complete. Further, the timestamps of all events are stored and interpreted relative to the completion of the loading of the most recent document. In this way, arbitrary loading times can be tolerated with no loss of synchronization.

As described previously, the present invention allows annotation authors to create hyperlinks to existing annotations. These are stored as ANNOTATION_LINK events. During playback, ANNOTATION_LINK events are interpreted by causing a special "link button" to appear on the browser temporarily. In the described exemplary embodiment, the link button appears initially bright red, and then slowly fades to white over a period of t seconds. Empirical tests show that five seconds is an appropriate value for t . After the link button becomes completely white, it is removed. While the link button is visible, the user may click on it. Clicking on the link causes the playback of the current annotation to pause, and playing to begin of the target annotation, that is, the annotation with the ID stored in the ANNOTATION_LINK event. When the target annotation concludes, the playback of the previous annotation resumes at the event where it left off.

As there may be several annotation hyperlinks followed during a single playback session, a stack is required to maintain the state of the playback. Whenever the link button is clicked, the current annotation, and the index of the next event in the

